Classroom Voting Questions: Statistics

Inference for the Mean of a Population

1. If you are testing two groups of individuals to see if they differ in regards to their working memory capacity, your alternative hypothesis would be that the two groups

   (a) differ significantly in terms of working memory capacity.

   (b) differ in terms of working memory capacity.

   (c) differ, but not significantly, in terms of working memory capacity.

   (d) do not differ in terms of working memory capacity.

   (e) do not differ significantly in terms of working memory capacity.

   Answer: (b). Note: One point of this question is that the word significant has a specific meaning in statistics that differs from the regular English use of the word.

   (A), (C) Significance is not a part of the hypotheses, which are about population parameters.

   (B)* correct The alternative hypothesis is a statement about population parameters, not sample statistics. The term *significant* is a short-hand terms for *statistically significant* , which means that two sample statistics are discrepant enough that we should consider the two samples to be from different populations. In English, the word *significant* generally means important, which can be examined through measures of effect size or by changing the null hypothesis (change "differ").

   (D) This statement is the null hypothesis not the alternative hypothesis. The alternative hypothesis is always about differences, not equalities.

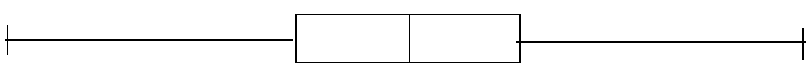
   (E) See the comments for (A), (C), and (D).

   by Murphy, McKnight, Richman, and Terry

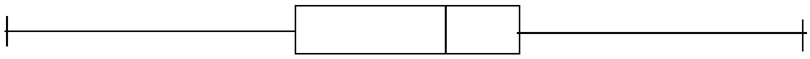
   STT.07.01.030

   CC KC MA207 F09: 56/**16**/8/20/0 time 2:00
   AS DH MA3321 Su12: 31/**46**/8/15/0 time 1:30
   CC KC MA207 F15: 77/**23**/0/0/0 time 2:00
   CC KC MA207 F18: 26/**68**/0/5/0

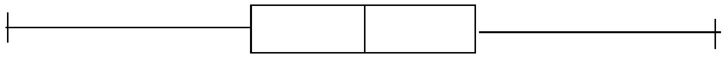
2. This box plot is for a sample that accurately represents a normal distribution:

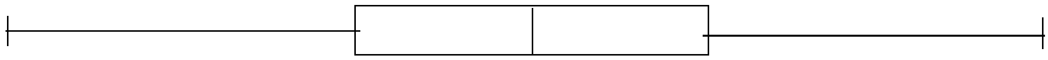


Which of the following box plots is for a sample that represents a Student's t-distribution with the same standard deviation and sample size as the normal distribution above?

(A) 

(B) 

(C) 

(D) 

(E) Two from (A)-(D) are correct.

(F) Three from (A)-(D) are correct.

(G) All from (A)-(D) are correct.

Answer: (d). (A) This box plot is not symmetrical within the box whereas a Student's t-distribution is symmetrical.

(B) This box plot is not symmetrical in the whiskers whereas a Students t-distribution is symmetrical.

(C) This box plot represents a distribution that is symmetrical but less spread out than that given for the normal distribution. However, since the two distributions have the same standard deviations and sample size, the Student's t-distribution would be more spread out rather than less spread out than the normal distribution.

(D)* correct As expected in the Student's t-distribution of interest, this box plot is symmetrical and more spread out in the box and in the whiskers suggesting a distribution that is more spread out and that does not rise as high as that for the normal distribution (although the height cannot be determined from the box plot).

(E), (F), (G) Only (D) is correct.

by Murphy, McKnight, Richman, and Terry

STT.07.01.040

CC HZ MA207 F09: 0/6/38/**25**/31/0/0 time 2:00
CC KC MA207 F09: 0/0/12/**48**/40/0/0 time 3:00
AS DH MA3321 Su12: 0/0/7/**64**/29/0/0 time 2:30
AS DH MA1333 010 F12: 0/0/23/**0**/69/8/0 time 3:20
AS DH MA1333 020 F12: 8/0/8/**42**/33/0/8 time 2:30
AS DH 1333 010 S13: 0/0/6/**44**/31/19/0 time 2:40

AS DH 1333 020 S14: 0/0/0/**8**/68/24/0 time 2:50 ,
AS DH 1333 020 F15: 0/0/8/**50**/42/0/0 time 2:50 ,
CC KC MA207 F15: 0/0/22/**11**/67/0/0 time 3:00
AS DH 1342 010 F17: 0/3/19/**65**/3/10/0 time 2:30

3. A random sample of 25 observations, with a mean of 44.4 and a sample standard deviation of 3.5, is drawn from a population that is approximately normally distributed. If one sets up a hypothesis test with population mean equal to 43 against an alternative that the population mean is not 43, using $\alpha = 0.01$, what is the value of the test statistic?

   (a) 2.000
   (b) 2.576
   (c) 2.797
   (d) 2.857
   (e) 10.000

   Answer: (a). Note: This computation question assesses whether students can calculate a one-sample t-statistic.

   (A)* correct using the formula

$$t = \frac{\bar{y} - \mu}{s/\sqrt{n}} = \frac{44.4 - 43}{3.5/\sqrt{25}} = \frac{(44.4 - 43) * 5}{3.5}$$

   (B) 2.576 is the critical value (from a table or other resource) using a z-distribution, not the calculated statistic.

   (C) 2.797 is the critical value (from a table or other resource) using a t-distribution, not the calculated statistic.

   (D) $(44.4 - 43) * 25/(3.5)^2$ using s^2 instead of s and failing to take the square root of n.

   (E) (44.4-43)*25/3.5 using n instead of the square root of n.

   by Murphy, McKnight, Richman, and Terry

   STT.07.01.050

   CC KC MA207 F09: **48**/13/39/0/0 time 5:00
   AS DH MA3321 Su12: **87**/0/7/7/0 time 3:30
   AS DH MA1333 010 F12: **90**/10/0/0/0 time 3:40
   AS DH MA1333 020 F12: **100**/0/0/0/0 time 4:00
   AS DH 1333 010 S13: **83**/0/11/6/0 time 3:10
   AS DH 1333 020 S14: **96**/0/4/0/0 time 2:50 ,
   AS DH 1333 010 F14: **93**/4/4/0/0 time 2:40 ,

AS DH 1333 020 S15: **73**/0/27/0/0 time 2:40 ,
AS DH 1333 020 F15: **100**/0/0/0/0 time 2:30 ,
CC KC MA207 F15: **100**/0/0/0/0 time 4:30
AS DH 1342 010 F17: **94**/0/3/0/3 time 3:00
CC KC MA207 F18: **93**/0/7/0/0
AS DH 1342 020 F18: **97**/0/3/0/0 time 3:00
AS DH 1342 040 S19: **100**/0/0/0/0 time 2:20
AS DH 1342 030 F19: **100**/0/0/0/0 time 3:10

4. A random sample of 25 observations, with a mean of 44.4 and a sample standard deviation of 3.5, is drawn from a population that is approximately normally distributed. If one sets up a hypothesis test that the population mean is equal to 43 against an alternative that the population mean is not 43, using $\alpha = 0.01$, what is the 0.01 significance point (critical value) from the appropriate distribution?

   (a) 2.576.
   (b) 2.797.
   (c) -2.576.
   (d) -2.797.
   (e) Both (a) and (c) are correct.
   (f) Both (b) and (d) are correct.

   Answer: (f). by Murphy, McKnight, Richman, and Terry (027v3)

   Note: This question can serve as a good class discussion question to get at the choice between z and t and the choice between one- and two-tailed.

   Note: This question cannot be modified to have fewer responses.

   (A) This value comes from a z-table (or similar resource) for the upper one-tail rejection region.

   (B) This value comes from a t-table (or similar resource, df = 24, /2 = .005) for the upper one-tail rejection region.

   (C) This value comes from a z-table (or similar resource) for the lower one-tail rejection region.

   (D) This value comes from a t-table (or similar resource, df = 24, /2 = .005) for the lower one-tail rejection region.

   (E) This answer is correct only if the hypothesis test is a two-tailed z-test. However, Using z-distribution may encounter large measurement error problems.

   (F)* correct - This answer is correct if the hypothesis test is a two-tailed t-test. This question intends to differentiate between t-distribution and z-distribution. Both distributions are okay here. However, choosing t-distribution is a more conservative approach and will be more accurate because it can take care of the higher probability in the extremes (a.k.a. the fat-tail problem).

STT.07.01.051 DH 160

AS DH MA1333 010 F12: 0/0/0/10/50/**40** time 4:30
AS DH MA1333 020 F12: 0/0/0/0/9/**91** time 4:00
AS DH 1333 010 S13: 8/17/17/0/33/**25** time 3:20
AS DH 1333 020 S14: 0/0/0/0/28/**72** time 3:30 ,
AS DH 1333 010 F14: 4/7/0/11/7/**70** time 3:30 ,
AS DH 1333 020 S15: 0/0/30/10/20/**40** time 2:50 ,
AS DH 1333 020 F15: 0/0/0/0/15/**85** time 3:10 ,
AS DH 1342 010 F17: 0/5/0/0/41/**55** time 2:50
CC KC MA207 F18: 0/25/0/6/0/**69**
AS DH 1342 020 F18: 0/0/3/5/73/**19** time 3:10
AS DH 1342 040 S19: 0/0/0/0/83/**17** time 3:20
AS DH 1342 030 F19: 0/0/0/0/50/**50** time 4:20
CC KC MA315 S20: 11/53/0/0/11/**26**

5. A random sample of 25 observations, with a mean of 44.4 and a sample standard deviation of 3.5, is drawn from a population. If one sets up a hypothesis test that the population mean is equal to 43 against an alternative that the population mean is not 43, using $\alpha = 0.05$, what is the 0.05 significance point (critical value) from the appropriate distribution?

   (a) 1.96.
   (b) 2.064.
   (c) -1.96.
   (d) -2.064.
   (e) None of the above

   Answer: (e). by Murphy, McKnight, Richman, and Terry (028v3)

   Note: This question emphasizes the normality assumption for a t-test.

   (A) This value comes from a z-table (or similar resource) for the upper one-tail rejection region but is appropriate only if the population is normal.

   (B) This value comes from a t-table (or similar resource, df = 24, /2 = .025) for the upper one-tail rejection region but is appropriate only if the population is normal.

   (C) This value comes from a z-table (or similar resource) for the lower one-tail rejection region but is appropriate only if the population is normal.

   (D) This value comes from a t-table (or similar resource, df = 24, /2 = .025) for the lower one-tail rejection region but is appropriate only if the population is normal.

   (E)* correct - The population is **not** specified to be approximately normal and the sample size is too small to be statistically robust.

   STT.07.01.052 DH 170

AS DH MA1333 010 F12: 67/0/0/0/**33** time 1:00
AS DH MA1333 020 F12: 63/0/0/13/**25** time 1:00
AS DH 1333 010 S13: 40/0/20/0/**40** time 3:00
AS DH 1333 020 F15: 6/17/0/0/**78** time 3:30 ,
CC KC MA207 F15: 78/22/0/0/**0** time 2:30
CC KC MA315 F15: 0/25/13/62/**0** time 2:30
CC KC MA315 F18: 0/39/3/27/**30**
CC KC MA315 S20: 0/63/0/5/**32**

6. A random sample of 25 observations, with a mean of 44.4 and a sample standard deviation of 3.5, is drawn from a population that is approximately normally distributed. If one sets up a hypothesis test with population mean equal to 43 against an alternative that the population mean is not 43, using $\alpha = 0.01$, does one reject the null hypothesis and why?

   (a) Yes, the test statistic is larger than the tabled critical value.

   (b) No, the test statistic is larger than the tabled critical value.

   (c) Yes, the test statistic is smaller than the tabled critical value.

   (d) No, the test statistic is smaller than the tabled critical value.

   (e) insufficient information

   Answer: (d).

   (A) The test statistic is not larger than the tabled value.

   (B) The test statistic is not larger than the tabled value.

   (C) Because the test statistic is smaller than the tabled value, one should not reject the null hypothesis.

   (D)* correct - Because the test statistic is smaller than the tabled value, one should not reject the null hypothesis.

   (E) There is enough information, with some details indicated in the preceding three questions.

   by Murphy, McKnight, Richman, and Terry (030v3)

   STT.07.01.053 DH 180
   AS DH MA1333 010 F12: 0/9/9/**82**/0 time 1:30
   AS DH MA1333 020 F12: 0/0/7/**86**/7 time 1:20
   AS DH 1333 010 S13: 0/25/25/**50**/0 time 1:20
   AS DH 1333 020 S14: 0/4/12/**84**/0 time 1:40 ,
   AS DH 1333 010 F14: 4/15/0/**81**/0 time 1:30 ,
   AS DH 1333 020 F15: 0/8/0/**88**/4 time 1:50 ,
   CC KC MA315 F15: 0/19/0/**75**/6 time 3:00
   AS DH 1342 010 F17: 3/0/6/**91** time 1:50

CC KC MA207 F18: 0/6/12/**82**/0
AS DH 1342 020 F18: 0/0/3/**97** time 2:20
AS DH 1342 040 S19: 0/0/33/**67** time 2:30
AS DH 1342 030 F19: 0/6/25/**69** time 2:20

7. In a random sample of 2013 adults, 1283 indicated that they believe that rudeness is a more serious problem than in past years. Which of the test statistics shown below would be appropriate to determine if there is sufficient evidence to conclude that more than three-quarters of U.S. adults believe that rudeness is a worsening problem?

   (a) $\dfrac{\hat{p} - .5}{\sqrt{(.5)(1 - .5)/2013}}$

   (b) $\dfrac{\hat{p} - .75}{\sqrt{(.75)(1 - .75)/2013}}$

   (c) $\dfrac{\bar{x} - .75}{\sqrt{s/2013}}$

   Answer: (b).

   by Roxy Peck

   STT.07.01.057 DH 110

   AS DH MA1333 010 F12: 0/**64**/36 time 2:00
   AS DH MA1333 020 F12: 0/**29**/71 time 2:20
   AS DH 1333 010 S13: 0/**94**/6 time 2:00
   CC KC MA207 F15: 0/**63**/27
   CC KC MA207 F18: 6/**83**/11
   AS DH 1342 020 F18: 0/**100**/0 time 2:30
   AS DH 1342 040 S19: 0/**100**/0 time 2:50
   AS DH 1342 030 F19: 0/**85**/15 time 2:50

8. A climate researcher sets up an experiment that the mean global temperature is $\mu = 60°$ F, looking for an indication of global warming in a climate model projection. For the year 2050, the series of 10 models predict an average temperature of 65° F. A standard one-tailed t-test is run on the data. Then the power of the test

   (a) increases as μ decreases.

   (b) remains constant as μ changes.

   (c) increases as μ increases.

   (d) decreases as μ increases.

Answer: (c). For this question, $H_0 : \mu = 60°\text{F}$ and $H_1 : \mu > 60°\text{F}$.

(A) The power would decrease as μ decreases. In addition, a decrease in μ is consistent with H_0 because if H_0 is true, then power is irrelevant.

(B) The power will not change only if effect sizes do not change, all other things being equal.

(C)* correct Power is the probability of not making a Type II error so the true μ is far enough away from the hypothesized μ_0 then the probability (β) of making a Type II error decreases and thus power $(1 - \beta)$ increases.

(D) See the explanation for (C).

by Murphy, McKnight, Richman, and Terry

STT.07.01.060

AS DH MA3321 Su12: 0/14/**86**/0 time 4:20

9. Kim's husband is in residency to become a medical doctor. He doesn't seem to get much sleep. Neither do his resident friends at the hospital. Kim hypothesizes that medical residents get, on average, less than 5 hours of sleep each day. She conducts a hypothesis test and gets statistically significant results. Which of the following might be a reasonable summary of the results?

   (a) Accept the null hypothesis. At the 5% significance level, the data provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.

   (b) Accept the null hypothesis. At the 5% significance level, the data do not provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.

   (c) Reject the null hypothesis. At the 5% significance level, the data provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.

   (d) Reject the null hypothesis. At the 5% significance level, the data do not provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.

   Answer: (c).

   (a) One of the first steps of a hypothesis test is to assume that the null hypothesis is true. Therefore, "accepting" the null hypothesis cannot be a result of the test. ("Proving" something that one assumes is the definition of circular reasoning.) [Follow-up questions: Momentarily ignore the hypothesis test machinery. Imagine Kim obtaining a sample with a mean of 5.06 hours and that this was nowhere near large enough to reject the hull hypothesis. Imagine Kim then standing on top of a table and shouting, "Forget all that $\mu > 5$ talk. I've just shown that $\mu = 5$!"

Would you be convinced? Would you be any more convinced if Kim showed you that she had written the statement $\mu = 5$ on a piece of paper...and perhaps given the statement a label like "the null hypothesis?" If you are thinking, "Yeah, but 5.06 is close to 5," or "But what if Kim's sample mean were 'exactly' 5 instead of 5.06?," can you think of a statistical procedure other than a hypothesis test that Kim might have used and that might feel more intuitive? (See the commentary in the following question.)]

(b) See part (a).

(c) Correct. There was statistically significant evidence for Kim's hypothesis, the alternative hypothesis ($\mu < 5$). (The null hypothesis, $\mu = 5$, is rejected.)

(d) See part (c). The data *do* provide statistically significant evidence for the alternative hypothesis.

by David A. Huckaby

STT.07.01.070
AS DH 3321 010 F16: 0/3/**97**/0 time 2:00
AS DH 1342 010 F17: 41/0/**56**/4 time 2:50
CC KC MA207 F18: 0/0/**100**/0
CC KC MA315 F18: 0/3/**85**/12
AS DH 1342 020 F18: 29/14/**38**/19 time 2:50
AS DH 1342 040 S19: 0/20/**50**/30 time 3:30
AS DH 1342 030 F19: 21/0/**74**/5 time 3:50

10. Kim's husband is in residency to become a medical doctor. He doesn't seem to get much sleep. Neither do his resident friends at the hospital. Kim hypothesizes that medical residents get, on average, less than 5 hours of sleep each day. She conducts a hypothesis test but does not get statistically significant results. Which of the following might be a reasonable summary of the results?

(a) Do not reject the null hypothesis. At the 5% significance level, the data provide sufficient evidence to conclude that the mean hours of sleep for medical residents is 5 hours.

(b) Do not reject the null hypothesis. At the 5% significance level, the data provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.

(c) Do not reject the null hypothesis. At the 5% significance level, the data do not provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.

(d) Reject the null hypothesis. At the 5% significance level, the data do not provide sufficient evidence to conclude that the mean hours of sleep for medical residents is less than 5 hours.

Answer: (c). There was not statistically significant evidence for Kim's hypothesis, the alternative hypothesis ($\mu < 5$). (The null hypothesis, $\mu = 5$, could not be rejected.) Answer choice (a) catches the misconception that the null hypothesis can be established as the result of a hypothesis test. (See the commentary in the previous question.) [Follow-up question: Can you relate confidence intervals to hypothesis tests? For this particular example, imagine that after obtaining her sample Kim had constructed a 95% confidence interval for the sample mean. Discuss whether Kim would reject the statement $\mu = 5$ and accept the statement $\mu > 5$ in these two scenarios: 1) The entire confidence interval lies above 5. 2) The entire confidence interval does not lie below 5 (i.e., either the confidence interval contains 5 or the entire confidence interval lies below 5). Note how constructing a confidence interval affords Kim the possibility of rejecting the null hypothesis, while also providing a likely range of values for μ. Moreover, the confidence interval is more intuitive for most folks: With the hypothesis test, we assume that the null hypothesis is true and use our data to show that this assumption is unlikely. (This is very much like a proof-by-contradiction, but instead of obtaining a situation that is imposible, we obtain a situation that is improbable.) Unlike a hypothesis test, which assumes the null hypothesis and then attemps to show that the data are unlikely, a confidence interval starts with the data and attempts to show that the null hypothesis is unlikely. Most people find the latter approach more natural: The data are real, so it makes sense to start with them.]

by David A. Huckaby

STT.07.01.080

AS DH 3321 010 F16: 0/4/**96**/0 time 2:10
AS DH 1342 010 F17: 0/3/**91**/6 time 2:30
AS DH 1342 020 F18: 0/4/**89**/7 time 2:00
AS DH 1342 040 S19: 0/7/**93**/0 time 2:50
AS DH 1342 030 F19: 0/0/**95**/5 time 2:20

11. The state legislature ordered that a study be done to see whether the mean number of reported crimes at institutions of higher learning across the state differs from the national mean. A hypothesis test will be performed at the 1% significance level using the critical-value approach. What are the critical values?

    (a) $\pm\frac{t_{0.01}}{2}$
    (b) $\pm t_{\frac{0.01}{2}}$
    (c) $\pm\frac{t_{0.99}}{2}$
    (d) $\pm t_{\frac{0.99}{2}}$

    Answer: (b).

    by David A. Huckaby

STT.07.01.090

AS DH 3321 010 F16: 0/**81**/3/17 time 2:10
AS DH 1342 010 F17: 9/**85**/6/0 time 2:00
AS DH 1342 020 F18: 16/**84**/0/0 time 2:10
AS DH 1342 040 S19: 40/**60**/0/0 time 2:40
AS DH 1342 030 F19: 0/**100**/0/0 time 2:30

12. Cody thinks that on average more than 30 students enter the gym between 12:00 p.m. and 12:30 p.m. on class days. If Cody performs a hypothesis test, a decrease in which of the following quantities—all other quantities remaining the same—would increase the probability of Cody's rejecting the null hypothesis?

    (a) sample size
    (b) sample variance
    (c) sample mean

    Answer: (b). The larger the test statistic, the more likely Cody will get statistically significant results and reject the null hypothesis. The test statistic is $(\bar{x} - 30)/\frac{s}{\sqrt{n}} = (\bar{x} - 30)\frac{\sqrt{n}}{s}$.

    (a) Decreasing the sample size n *decreases* the test statistic.
    (b) Correct. Decreasing the sample variance s^2 (and therefore the standard deviation s) increases the test statistic.
    (c) Decreasing the sample mean $\bar{x}$ *decreases* the test statistic.

    [Follow-up question: We can see from the formula how the probability of obtaining statistically significant results is effected by increasing or decreasing the sample size, the sample variance, or the sample mean. Convince yourself that these relationships make sense intuitively.]

    by David A. Huckaby

    STT.07.01.100
    AS DH 3321 010 F16: 12/**56**/32 time 3:10
    AS DH 1342 020 F18: 22/**59**/19 time 4:00
    AS DH 1342 040 S19: 14/**36**/50 time 3:30
    AS DH 1342 030 F19: 25/**50**/25 time 3:30

13. Cody thinks that on average more than 30 students enter the gym between 12:00 p.m. and 12:30 p.m. on class days. If Cody performs a hypothesis test, and gets a P-value of 0.02, what is the probability that more than 30 students will enter the gym between 12:00 pm and 12:30 pm on a randomly-selected class day?

(a) less than 0.02

(b) 0.02

(c) more than 0.02

(d) The answer cannot be determined from the information given.

Answer: (d). The P-value is a conditional probability: It is the probablility of obtaining a test statistic as extreme or more extreme than the one obtained *under the assumption that the null hypothesis is true*. (Is the null hypothesis true? Because the null hypothesis is assumed to be true at the beginning of a hypothesis test, the test can never validate the null hypothesis; it can only possibly invalidate it.) The (absolute) probability of 30 students entering the gym between 12:00 pm and 12:30 pm on a randomly-selected class day cannot be determined from the given information.

by David A. Huckaby

STT.07.01.110

AS DH 3321 010 F16: 13/81/6/**0** time 3:00
CC KC MA207 F18: 6/22/56/**17**
CC KC MA315 F18: 3/28/16/**53**

14. A drug company claims that their new weight loss pill will cause obese people to lost an average of 15 pounds after six weeks of use. The null hypothesis is that the mean is 15 pounds, while the alternative hypothesis is that the mean is less than 15 pounds. We try out the pill on 75 obese people and find that, after six weeks, the mean weight loss is only 8.2 pounds. The P-value of our result is 0.00216. What do we conclude?

(a) This proves that the pill works as claimed by the drug company.

(b) This proves that the pill does not work as claimed by the drug company.

(c) The results are ambiguous, so we can draw no conclusions.

(d) None of the above

Answer: (d). None of the above. P-values never allow us to "prove" anything. However, we can draw a conclusion. This low P-value tells us that these results would be very unlikely if the null hypothesis were true, so we reject the drug company's claim and conclude that the drug does not cause an average of 15 pounds of weight loss.

by Project InterStats

STT.07.01.112

CC KC MA315 F18: 6/53/3/**38**
CC KC MA315 S20: 0/50/25/**25**

15. A tire company claims that their tires last an average of 30,000 miles. Our null hypothesis is that the claim is true, while our alternative hypothesis is that the tires last for an average of less than 30,000 miles. We test 50 of their tires finding that this sample lasts only for an average of 28,000 miles. We calculate a P-value of 0.389 for this result. What do we conclude?

    (a) We conclude that the company's claim is correct.
    (b) We conclude that the company's claim is incorrect.
    (c) The results are ambiguous, so we can draw no conclusions.
    (d) None of the above

    Answer: (c). We can draw no conclusion. This P-value tells us that these results would not be unlikely if the null hypothesis is correct, so we fail to reject the null hypothesis. It could be that the null hypothesis is true. It could also be that our sample size was not large enough to demonstrate that our null hypothesis is untrue. We can draw no conclusions.

    by Project InterStats

    STT.07.01.113

16. Zoe wants to know the average height of trees in her city. She randomly selects thirty trees in her city and measures their heights, obtaining a mean of 37.1 feet and a standard deviation of 15.6 feet. Which statistical procedure should she perform? (Assume that all assumptions for the procedure are satisfied.)

    (a) confidence interval for one mean with σ known (z-interval procedure)
    (b) confidence interval for one mean with σ unknown (t-interval procedure)
    (c) hypothesis test for one mean with σ known (z-test)
    (d) hypothesis test for one mean with σ unknown (t-test)

    Answer: (b). Zoe wants an estimate for the mean height of trees in her city. Her sample has supplied her with a point estimate of 37.1 feet. She would now go ahead and construct a confidence interval. As is usually the case, the population standard deviation is not known. (The standard deviation of 15.6 feet was obtained from the sample data and hence is the sample standard deviation.)

    by David A. Huckaby

    STT.07.01.120
    AS DH 3321 010 F16: 69/**19**/11/0 time 2:20
    AS DH 1342 010 F17: 72/**0**/28/0 time 2:10
    AS DH 1342 020 F18: 63/**9**/28/0 time 2:30
    AS DH 1342 040 S19: 36/**14**/50/0 time 3:50
    AS DH 1342 030 F19: 29/**18**/53/0 time 3:00

17. Stan and Priscilla head up the family's traditional Christmas tamale making, in which everyone gets together and makes an unbelievable number of tamales. You can always count on Tio Carlos insisting that the tamales be big. Are the tamales this year averaging 3.5 ounces like they always do? (The standard deviation in weights each year is around 0.31 ounces.) Stan and Priscilla randomly select twenty of the tamales made so far and find that their mean weight is 3.53 ounces. Which statistical procedure should they perform? (Assume that all assumptions for the procedure are satisfied.)

    (a) confidence interval for one mean with σ known (z-interval procedure)

    (b) confidence interval for one mean with σ unknown (t-interval procedure)

    (c) hypothesis test for one mean with σ known (z-test)

    (d) hypothesis test for one mean with σ unknown (t-test)

    Answer: (c). Stan and Priscilla want to test whether the population mean, the average weight of all the tamales the family has made so far this year, is greater than 3.5 ounces. The population standard deviation is "known," as the typical population standard deviation from years past can reasonably be used.

    by David A. Huckaby

    STT.07.01.130

    AS DH 3321 010 F16: 3/3/**81**/14 time 2:40
    AS DH 1342 010 F17: 6/0/**92**/3 time 2:50
    AS DH 1342 020 F18: 0/0/**88**/13 time 3:10
    AS DH 1342 040 S19: 0/0/**0**/100 time 3:20
    AS DH 1342 030 F19: 0/0/**72**/28 time 2:50

18. David wants to know whether the mean brix level of Haden mangoes available in his city's supermarkets differs from 14. He randomly selects thirty Haden mangoes from his city's supermarkets and measures their brix levels, finding the mean to be 13.3, with a standard deviation of 1.8. Which statistical procedure should he perform? (Assume that all assumptions for the procedure are satisfied.)

    (a) confidence interval for one mean with σ known (z-interval procedure)

    (b) confidence interval for one mean with σ unknown (t-interval procedure)

    (c) hypothesis test for one mean with σ known (z-test)

    (d) hypothesis test for one mean with σ unknown (t-test)

    Answer: (d). David wants to test whether the population mean, the mean brix level of Haden mangoes available in his city's supermarkets, differs from 14. As is usually the case, the population standard deviation is not known. (The standard deviation of 1.8 was obtained from the sample data and hence is the sample standard deviation.)

    by David A. Huckaby

STT.07.01.140

AS DH 3321 010 F16: 3/11/8/**78** time 1:30
AS DH 1342 010 F17: 8/17/0/**75** time 2:30
AS DH 1342 020 F18: 6/3/9/**81** time 1:50
AS DH 1342 040 S19: 0/7/0/**93** time 2:00
AS DH 1342 030 F19: 0/20/4/**76** time 2:20